



Ranger AR-3500 by Clear Channel Corporation 1985

The "corrected" alignment procedure by W4BTK.

##

READ THIS FIRST

Notice: I've made "corrections" that I've verified myself to these instructions and they are correct to the best of my knowledge. However, I take no responsibility for any problems caused by you following these steps. I'm not a professional technician and electronics is a hobby for me. I do not repair radios for anyone. Please don't ask. I've performed these steps in my own Ranger AR-3500 as seen on the picture. I haven't performed the 100 W tune steps as my radio is the 30 W version. Follow these instructions at your own risk.

INTRODUCTION

Produced in Japan around 1985, the Clear Channel Corporation Ranger model AR-3500 was a famous 10 meters transceiver. Sadly, no longer manufactured. The initial AR-3500 had a 4-PIN microphone connector which was later replaced with an 8-PIN connector for microphones with UP/DOWN buttons.

A company founded in 1972 from Malaysia, RCI (Ranger Communications Inc), issued their version of "RANGER" in following years completely unrelated to Clear Channel Ranger AR-3500 where the name Ranger was just part of the model name. So for example, RCI-2950 is not a newer version of the AR-3500. It is a completely different radio.

Note there was also a previous Ranger model, the AR-3300 released in 1982 but with some modulation problems later corrected in the AR-3500 model.

For those looking for information on how to properly adjust / align this radio, I will provide some valuable information below.

WARNING: This is not for those looking for loud modulation, maximum RF power and other poorly implemented modifications.

Note the PCB labels have errors that will confuse you.

During my research time I found that some folks incorrectly state in internet forums there are "mistakes" in the alignment procedure. The service manual is correct and is based on the schematic. As I mentioned above, the problem are incorrect labels on the circuit board.

Before starting, it is always recommended sending your radio to a qualified technician unless you know you are capable of following all procedures with ease.

You will need the following tools:

- Frequency counter
- Oscilloscope
- Service monitor or equivalent tools such as a power meter and signal generator
- Multimeter
- Mica, ceramic or plastic (anti-static) screwdriver tuning set

STOP! Please, do **not** proceed if you don't have some technical skills and test equipment.

Turn on the radio and keep it running for about 20 minutes or more so all components reach operating temperature. I tend to turn the radio on and "forget about it" for an hour or so.

##

ALIGNMENT

SYNTHESIZER PLL VCO

- 1) Set the radio to FM and frequency 29.900 MHz.
- 2) Connect a multimeter in VDC to TP1 which is located near C243. Adjust T13 until the multimeter reads 3.8V
- 3) Set the radio to AM and frequency 28.000 MHz. Set the "clarifier" to the center.
- 4) Connect the oscilloscope to TP2 which is located near R213. Adjust T12 for maximum senoide in AM.
- 5) Connect the oscilloscope to the cathode of D77 located close to T11 (*which in the schematic is D77 but in the PCB layout is incorrectly labeled as D62 which is actually repeated in the final RF tank*). Adjust T11 for maximum senoide in AM.
- 6) Connect the frequency counter with a high impedance probe to TP3 which is located near R119.

If you are working on an AR-3500 with a 2.6kHz filter (labeled **10M2.6D 10695 S C C**) installed note the differences below and follow the proper adjustment settings:



4.2kHz filter

- A) Adjust T16 for 10.6925 -- or -- **10.6935 in USB mode.**
- B) Adjust T17 for 10.6975 -- or -- **10.6965 in LSB mode.**
- C) Adjust T15 for 10.6943 -- or -- **10.6943 in CW mode.**
- D) Adjust T14 for 10.6950 -- or -- **10.6950 in AM TX mode.**

2.6kHz filter

7) Connect the frequency counter to TP2 which is located near R213.

4.2kHz filter

2.6kHz filter

A) Adjust VR3 for 17.3050 -- or -- **17.3050 in FM mode.**

B) Adjust VR1 for 17.3075 -- or -- **17.3065 in USB mode.**

C) Adjust VR2 for 17.3025 -- or -- **17.3035 in LSB mode.**

8) Adjust T14 for output frequency 28.000 MHz in FM mode.

##

TRANSMITTER SSB MODE

1) Set the radio USB and frequency 28.000 MHz then turn the microphone gain "**MIC GAIN**" to minimum.

2) Connect the Service Monitor RF input to the antenna jack. Set the Service Monitor to RX TEST or SPECTRUM ANALYZER screen. Set your Service Monitor to 28.000 MHz and SSB demodulator. You may instead use a simple RF power meter. The goal is to have the least to no amount of RF signal output.

3) If you see RF signal, adjust VR9* (LSB) and VR10 (USB), both vertical trimpots located near the front of the radio, for minimum RF output while the radio is in transmit (TX). Note if an adjustment is needed, complete the adjustment then re-do step 6 of **SYNTHESIZER PLL VCO** above.

(*) There are two VR9 labels on the PCB and the PCB design. The VR9 near VR7 is actually VR8. You can confirm this by looking at the top right corner area of the schematic.

4) **Driver Bias:** Set the **MIC GAIN** to minimum, mode to LSB in TX. Connect the multimeter to the ferrite bead side of R198 and ground. Adjust VR14 for 0.68 VDC. Will come back to this after step 6 below.

5) **Final Amp Bias:** Move the multimeter to the ferrite bead side of R190 and adjust VR12 for 0.68 VDC.

6) **Final Amp Bias:** Move the multimeter to the ferrite bead side of R194 and adjust VR13 for 0.68 VDC. You may back to step 4 above and re-adjust VR14 for best modulation swing.

Below steps are for units with 100 W RF output:

Remove the red power lead of amplifier at main power jack. Insert AMP Meter in series with removed red wire and positive pin of power jack. Adjust VR101 for 150 milliamperes.

7) Set **MIC GAIN** to maximum and apply 1 kHz tone to microphone. Adjust VR15 for maximum RF output.

8) Adjust T22, T21, T20 & T19 for maximum RF output

9) Balance RF output between lowest & highest frequency with L6, L7 and L9

10) Re-adjust VR15 (ALC) so that output power just starts to drop (about 2 watts)

End of 100 W RF output adjustments

##

AM MODE

1) Set radio to 28.0000 MHz AM mode, MIC GAIN on maximum.

2) Adjust VR16**, (AM POWER) for 7 Watts output power (30 Watts for 100 Watt Model)

3) Apply 1 kHz tone to microphone and adjust VR17 (AMC = Automatic Modulation Control) for 95 %

** The original service manual states VR6 in error. AM POWER is VR16 on both schematic and PCB.

##

FM MODE

1) Set radio to 28.0000 MHz FM mode, MIC GAIN maximum.

2) Apply 1 kHz tone to microphone and adjust VR4 (FM DEV) for a maximum deviation of 5 kHz.

##

RF OUTPUT METER (TX RED LEDs)

- 1) Set radio to 28.0000 MHz FM mode.
- 2) Adjust VR11 so that two LED bars are lit with 7 Watt output power (10).

##

IF

10.695 MHz

1) Set the radio to AM mode and apply a 10.6950 MHz AM modulated at 60% signal from the signal generator or Service Monitor through a 10 to 1 probe to the emitter of Q2 (left leg which connects to T3). Q2 is located above T4. The output of signal generator should be just enough to produce output at speaker, about 12dB SINAD. Any excessive output from the signal generator will activate AGC which will result in false alignment.

2) Adjust T4, T5, T8, T9 and T10 for maximum AF output.

3) Set radio to CW mode, signal generator to 0% modulation. Adjust T6 and T7 for maximum AF output.

##

NOISE BLANKER (NB)

1) Connect a noise generator in series with signal generator output or use track generator from a Service Monitor. Connect the oscilloscope to TP4 located near R411. Set signal generator for 20 μ V output. Adjust T400 & T401 for maximum peaks.

##

HIGH FREQUENCY

- 1) Set radio to 28.0000 MHz on AM mode.
- 2) Apply a 28.0000 MHz (AM modulated at 60%) signal to antenna.

3) Adjust T1, T2 and T3 for maximum AF output. Output of Signal Generator should be about 12 db SINAD.

##

IF NOISE

- 1) Set radio to LSB mode and disconnect any input to antenna terminal.
- 2) Adjust R39 (IF GAIN) for an AF output of 0.2 Vrms with "AF GAIN" at maximum.

##

SIGNAL METER (**RX GREEN LEDs**)

- 1) Set radio to 28.0000 MHz on FM mode
- 2) Apply a 28.0000 MHz signal to antenna at 50 μ V.
- 3) Adjust VR7 so that four LED bars are lit (s9).
- 4) Set radio to USB mode.
- 5) Adjust VR8 (*which is labeled incorrectly as VR9 on PCB*) so that four LED bars are lit (s9).

##

FM QUADRATURE

- 1) Set the radio to FM mode. Inject a 28.0000 FM deviation at 5 kHz, 1 kHz tone signal from signal generator to antenna. Connect oscilloscope to junction of R123 and C96.
- 2) Adjust T18 for maximum sin-wave with minimum distortion.



MISCELLANEOUS

[Schematic and Service Manual](#) (Dropbox)